Tanta University

Department: Electronics and Electrical Communications
Programme: Under-graduate (Final Exam)
Total Marks: (125) Marks

Faculty of Engineering

Course Title: Satellite Communication Systems
Date: 22/01/2017

Course Code: EEC4122
Allowed time: 3 hrs.

Year: 4th Year
No. of Pages: (2)

Remarks: (assume any missing data – use graphs and examples whenever you have a chance)
You may use the following data: R = 6371 Km, a_{GSO} = 42164 Km

Question No. 1 : (16) Marks

a- Mention **three** advantages for Satellite Communications over other methods. **(3) Marks**

b- Mention **four** characteristics of polar orbiting satellites. **(4) Marks**

c- State Kepler's laws that govern the motion of satellites around the earth. **(9) Marks**

Question No. 2 : (29) Marks

a) For a given satellite, $e = 9.5981\times10^{-3}$ and mean anomaly is 204.9779 deg., the mean motion is 14.2171404 rev/day, a = 7194.9 Km. Calculate (assuming near-circular orbit): **(10) Marks**

i. the true anomaly (v), (4) Marks

ii. the magnitude of the radius vector (r) 5 s after epoch. (3) Marks

iii. the radius vector (**r**) in vector form. (3) Marks

b) Aided with sketch, explain the problem of **earth eclipse of satellite** during equinox and how the satellite handles this issue. **(8) Marks**

c) An earth station is situated, at mean sea level, at latitude 48.42° N, and longitude 89.26° W. Assume a minimum angle of elevation of 5°. Determine: **(11) Marks**

i. the function of the polar mount antenna, (2) Marks

ii. the angle of tilt required for a polar mount used with this earth station. (4) Marks

iii. the limits of visibility for this earth station. (5) Marks

Question No. 3 : (23) Marks

a) Compare between the three terms: **atmospheric attenuation**, **atmospheric absorption**, and **atmospheric scintillation**. **(9) Marks**

b) For any space segment: **(10) Marks**

i. Mention (**only**) the three functions of TT&C Sub-system. (3) Marks

ii. Define (**only**) the transponder (state its bandwidth and number for C-band). (4) Marks

iii. Draw (**only**) the basic block diagram for transponder system that connects between receive and transmit antenna. (3) Marks

c) Draw (**only**) the basic block diagram of Receive-only Home TV System. **(4) Marks**

Question No. 4 : (29) Marks

a) A satellite on a range of 42,000 km from a ground station is operating at 6 GHz and has receiver feeder losses of 1.5 dB, atmospheric absorption loss of 0.5 dB, antenna pointing loss of 0.5 dB, and depolarization loss due to a Faraday rotation angle of 4°. **(9) Marks**

i. Calculate the total link loss in [dB]. (5) Marks

ii. If a 3-m parabolic receive antenna is used with aperture efficiency of $\eta = 0.55$ and an EIRP of 56 dBW. Calculate the received power in [dBm]. (2) Marks

iii. Calculate carrier to noise spectral density ratio at receiver if the noise temperature is 185 K (State its unit) (2) Marks

b) Prove that for satellite downlink (entirely absorptive):

$$\left(\frac{N}{C}\right)_{rain} = \left(\frac{N}{C}\right)_{CS}\left(A + (A-1)\frac{T_a}{T_{S,CS}}\right)$$

where:

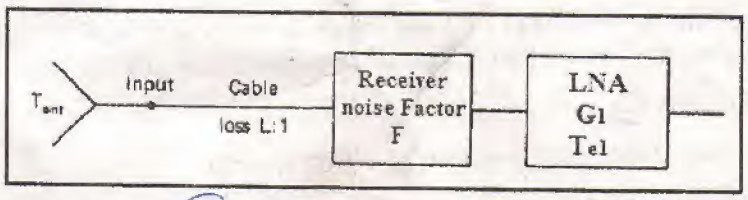
- A is absorptive attenuation (ratio)
- T_a is apparent absorber temperature
- $T_{S,CS}$ is System noise temperature in Clear-Sky

(7) Marks

c) For the system below, the receiver noise figure is 12 dB, the cable loss is 5 dB, the LNA gain is 50 dB, and its noise temperature is 150 K. The antenna noise temperature is 35 K. **(13) Marks**

i. Calculate the noise temperature referred to the input. (6) Marks

ii. Is this the optimal system arrangement? If not, rearrange the system for optimal operation. (Validate your answer!). (7) Marks



Question No. 5 : (28) Marks

a) Calculate the **maximum** possible longitudinal separation $\Delta\phi$ between two satellites in geostationary orbit. **(6) Marks**

b) Mention (only one-line each) the different steps of how GPS works. **(5) Marks**

c) Mention **four** reasons for using pseudo random sequences in GPS systems. **(8) Marks**

d) Define GDOP term used in GPS and explain (briefly aided with a sketch) how it can affect the accuracy of GPS receivers. **(9) Marks**

The end of questions

Good luck
Assoc. Prof. Amira Ashour (Coordinator of the Course)
Dr. Mahmoud Selim

Electronics and Electrical Comm. Dept.
Total Marks: 90 Marks
First term

Course Title: **Wave Propagation and Antennas (2)**	Course Code: EEC 4123	Year: 4th
Date: 26-1-2017	Allowed Time: 3 Hours	No. of Pages: (2)

Answer the following questions:

Question (1) *[18 marks]*

(a) **Draw** the E-plane and H-plane patterns of a rectangular waveguide of dimensions $(4\lambda \times 3\lambda)$. The waveguide is fed with TE_{10} mode. The electric field is oriented in Y-direction. The general expression for the electric field is given by

$$E_y = -E_o \left[\sin\left(\frac{m\pi}{a}x\right).\cos\left(\frac{n\pi}{b}y\right)\right] e^{-j\beta z}$$

(b) For uniform illuminated rectangular aperture of equal dimensions $a = b$ and circular aperture of radius $r = a$. Compare between them in terms of half power beamwidth (HPBW) and directivity.

Question (2) *[18 marks]*

(a) **Write down** the general expression of the array factor of a uniform feeding linear antenna array consisting of N antenna elements with uniform element spacing d then, **Derive** an expression for the half power beam width of the array in the broadside case $HPBW_{BS}$.

(b) Consider N=5 dipole elements separated by $d = \lambda/2$ with uniform feeding and progressive phase shift $\alpha = -\pi/2$. If the dipoles are placed on Z-axis, and oriented towards Y-axis.

1. Determine the array type.
2. Determine the main lobe direction.
3. Design the feeding network of the array.
4. Plot only the array factor.

Question (3) *[18 marks]*

(a) Consider a broadside binomial array consisting of $N = 8$ antenna elements with uniform element spacing $d = \lambda/2$. The array elements are short dipoles placed in Y-axis and oriented in X-direction.

1. Determine the excitation coefficients of the array elements.
2. Determine the DRR of the array.
3. Plot the array factor and the total field pattern.
4. Explain how to control the HPBW of the array.
5. State the advantages and disadvantages of the array.

Electronics and Electrical Comm. Dept.
Total Marks: 90 Marks
First term

Course Title: **Wave Propagation and Antennas (2)**	Course Code: EEC 4123	Year: 4th
Date: 26-1-2017	Allowed Time: 3 Hours	No. of Pages: (2)

Question (4) ***[18 marks]***

(a) Consider a broadside chebychev array consisting of $N = 4$ antenna elements with uniform element spacing $d = \lambda/2$. The array has side lobe level of $-20dB$.

1. Determine the excitation coefficients of the array.
2. Plot the array factor.
3. Explain why the chebychev array provides equal side lobes.
4. Plot the chebychev polynomial $T_9(z)$.

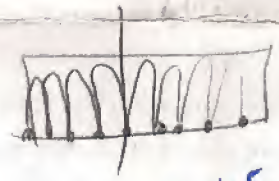
$z = z_0 \cos\psi$ $\quad \psi = \frac{\alpha + B_1 \cos\theta}{2}$ $\quad -\pi$ $\quad \phi_n = \frac{2\pi n}{N}$

Question (5) ***[18 marks]***

(a) Consider 8 elements broadside circular antenna array of radius $a = 2\lambda$. The array consists of short dipoles placed in X-Y plane and oriented in Z-direction.

1. Determine the equation of the array factor.
2. Plot the total field pattern of the array in the broadside direction.
3. State the advantages of the circular array over linear array.

$\sum_{n=0}^{N} |I_n| e^{j\alpha_n} e^{j\psi_n}$ $\quad$ Ra



2.405

Dr: Amr Hussein

15,166

12,56

$T_m(z) = \cosh(m \cosh^{-1}(z))$ $\quad R_0$

$\cosh\left(\frac{1}{m}\cosh^{-1}(R_0)\right)$

Tanta University

Department: Prod Engineering and Mech Design Dept
Total Marks: **40 Marks**

Faculty of Engineering

Course Title: **Project Management**	Course Code: **EEC41H5**	Year: **4th EEC41H5 Year**
Date: **17- 01- 2017 [Final Exam]**	Allowed time: **2 Hr**	No.of Pages: **(1)**

اجب عن جميع الأسئلة الاتية موضحا اجابتك بالرسم التوضيحى كلما امكنك ذلك(حل بقدر ما تستطيع):-
(الدرجات موزعة بالتساوى على جميع الأسئلة)

السؤال الأول:-

ا- عرف الادارة، وعرف المشروع، وعرف ادارة المشروعات، وما هى الأهداف الأساسية للمشروع؟.
ب- ما هى انواع المشروعات؟ وما هى عوامل نجاح المشروعات بشكل عام؟ وما الأسباب الأساسية لفشل المشروعات؟.
ج-أذكرطرق قياس أثر أداء المشروع؟ وماهى وسائل قياس أداء المشروع؟.

السؤال الثانى:-

ا- عرف دورة حياة المشروع(أو دورة تطور المشروع)؟ وأذكر بعض خصائص دورة المشروع مع رسم توضيحى يبين تغير الأفراد مع دورة حياة المشروع؟.
ب- تكلم باختصار عن مرحلة دراسة المشروع؟ و بين أهداف المشروع؟ و ما هى خصائص أهداف المشروع؟.
ج-أذكر العناصر الرئيسية للأنتاج؟ وما هى أهم الأدارات التى تتميز بها المشروعات؟.

السؤال الثالث:-

ا- عرف كلا مما يلى:-
التخطيط – الخطة – الموازنة – التنفيذ – المهمة – النشاط – ادارة التكامل – ادارة الجودة .
ب- أذكر ما الهدف من ادارة المشروع؟ وما هى مزايا ادارة المشروعات؟.
ج-ما هى أهم المهام فى عمليات التخطيط والرقابة للمشروع؟ مع شرح وتفصيل اثنين منهم؟.

السؤال الرابع:-

ا- عرف ما معنى تخطيط المشروعات؟ واذكر أهم المهام فى عمليات التخطيط، والرقابة للمشروع؟.
ب- ما هى العناصر اللازمة لاعداد خطة المشروع؟ وما هى خطة المبيعات للمشروع؟ وما هى خطة التسويق للمشروع؟.
ج-من الذى يقوم بالتخطيط ولماذا؟ وما المطلوب فى تخطيط المشروع؟.

السؤال الخامس:-

ا- ما هى أبعاد العملية الادارية وما هى وظائف المديرين فى ادارة المشروعات؟
ب- بين كيفية تخطيط المدير لعمله اليومى؟ وما هى وسائل تحقيق خطة العمل فى الادارة للمشروعات؟.
ج-أذكر أهم ما ينبغى أن تشتمل عليه خطة المشروع؟.

السؤال السادس:-

ا- عرف ما هى ادارة الانتاج؟ وما هى ادارة الانتاج والعمليات؟ وما هى أهداف الأداء فى ادارة الانتاج؟.
ب- ما هى الوظائف المتاحة فى مجال ادارة الانتاج؟ و ما هى العوامل المؤثرة على وظيفة ادارة الانتاج؟ وماهى وظائف نظام الانتاج؟ وبين ما هى مجالات اتخاذ القرار فى ادارة الانتاج؟.
ج-أذكر العناصر التسع اللازمة لاعداد خطةالمشروع؟ مع شرح مختصر لاثنين منهم؟.

انتهت الأسئلة

مع اجمل التمنيات بالتوفيق والنجاح
{{Dr Eng.: Alaa-Eldin A. El-Hammady}}

Tanta University

Department: Electronics & Electrical Communications

Faculty of Engineering

Total Marks: (90) Marks

Course Title: Telecommunication Networks	Course Code: EEC4124	Year: 2016/2017
Date: 12/1/2017	Allowed time: (3) hrs.	No. of Pages: (4)

Question No. 1 : Complete the following sentences: **(5 Marks: 0.5 mark for each item)**

A. The word ..... means "far off" or "distant" information transfer.
B. A ..... can be a computer, printer, or any other device capable of sending and/or receiving data in a network.
C. In.....connection, the link capacity is shared among network stations.
D. .....is an example of Metropolitan Area Networks (MAN).
E. Network topology is.....
F. In ..... topology, any tap device failure will cause the whole system fail.
G. ..... is an interconnection of star networks.
H. In twisted pair cables, the two conductors of a single circuit are twisted together for the purposes of .....
I. Transmission distance: in twisted-pair > coaxial cables. Thus, cable needs frequent use of .....to overcome the attenuation.
J. Microwaves are used for unicast communication such as.....

Question No.2: Choose the correct answer to complete the sentence:
(4 Marks: 0.5 Mark for each item)

A. Police radio is an example of ..... transmission.
   1. full duplex
   2. half duplex
   3. simplex
   4. broadcasting

B. The range of frequencies contained in the signal is called.....
   1. absolute bandwidth
   2. effective bandwidth
   3. spectrum
   4. throughput

C. Analog signals carry digital data in the.....
   1. modem
   2. telephone
   3. codec
   4. digital transceiver

D. According to Nyquist formulation for channel capacity, if the rate of signal transmission is 2B, then a signal with frequencies no greater than ..... is sufficient to carry the signal rate.
   1. 0.5B
   2. 2B
   3. 3B
   4. B

E. ..... measures the time required for a bit to travel from the source to the destination.

1. Transmission delay
2. Queuing time
3. Propagation delay
4. Processing delay

F. .....switched network assigns a dedicated communication path between the two communicating stations.

1. Circuit
2. Message
3. Packet
4. Cell

G. For a (M x N) crossbar switch, complexity equals.....

1. N^2
2. M^2
3. MN
4. 2MN

H. FM radio is..... propagation.

1. line of sight
2. ground wave
3. sky wave
4. line of sight and sky wave

1, 2

Question No.3: **(10 Marks)**

7

A. Define the following terms: **(2 Marks)**

1. Supervisory signaling.
2. WAN (Wide Area Network).

B. Compare between: **(4 Marks)**

1. In-channel and common channel signaling.
2. Hub and switch.

C. Explain with drawing the structure of the telephone number hierarchy. **(2 Marks)**

D. Discuss the advantages and disadvantages of message switching. **(2 Marks)**

Question No.4: **(11 Marks)**

10

A. Suppose the spectrum of a channel is between 3 MHz and 4 MHz, and SNR = 24dB. Using Shannon's formula, find the capacity limit C. If we want to achieve this limit, how many signaling levels are required at least? (2 Marks)

B. For a (N x N) baseline square two-stage network, deduce with drawing: **(3 Marks)**

1. the number of switching elements.
2. the switching capacity.
3. nonblocking condition.

C. Two three-stage switching networks (512x512) are designed. For each network, the number of inlets per block on the first stage n=16. The number of blocks on the second stage K is given as follows:

- Network 1: K=32.
- Network 2: K=64.

For each network, state if the network is blocking or not. **(3 Marks)**

D. The sender and the receiver are 3 hops apart on a datagram packet-switched network where each link is 150-mile long. Per-hop processing delay is 8 ms. Packets are 1200 bytes long. All links have a transmission speed of 56kbit/s. The speed of light in the wire is approximately 125,000 miles/s. If sender sends a 20-packet message to the receiver. How long will it take the receiver to receive the message up to the last bit (measured from the time the sender starts sending)? Indicate your answer with drawing.

(3 Marks)

Question No.5: **(15 Marks)**

A. Mention the general characteristics of forecasting.

B. Address the quantitative forecasting methods.

C. Explain in details the time series method using moving average.

D. Calculate the capacity of the 1st stage of an exchange required to be working over 20 years to reach its maximum capacity of 25000 subscribers. The expansion would be provided each quarter of its lifetime as 35% growth rate.

Question No.6: **(15 Marks)**

A. Explain the Forecasting of Subscriber Density.

B. What are the factors that can be used to measure the service quality?

C. What are the telephone traffic factors?

D. Calculate the expected number of terminals that will be required to be connected in the local area network after 5 years, if the number of served users now is 1000 subscribers and the annual growth rate is 0.05.

Question No.7: **(15 Marks)**

A. Draw the relationships between the three factors in the traffic system.

B. Draw and explain the different tele-traffic models (pure loss, pure waiting system, mixed system).

C. What are the principal queue parameters?

D. During a busy hour 'A' Erlang is offered to a single channel exchange that was occupied over a period of 49 minutes. When the lost traffic is overflowed to a multi-channel exchange, it was blocked during 1.2 minutes.

Determine:

a. The average number of busy channels.

b. The probability of finding 2 channels free simultaneously.

Question No.8: (15 Marks)

A. Compare between:
   a. Routing and forwarding
   b. Bellman-Ford and the Dijkstra models

B. Explain the local call charging methods.

C. Mention the function of the periodic pulse meter.

D. What is the traffic offered expressed in Erlang and the CCS if the calling rate and mean call duration for different cases are respectively:
   a. 1000 c/h; 90 sec.
   b. 1200 c/h; 2 minute.
   c. 4 c/s; 1.6 minute.
   d. 3 c/m; 0.04 hour.

E. A group of 3 channels is tested 100 times. It is found that one channel is being busy 50 times and 2 channels 18 times. If the blocking probability is 2%, find:
   a. The probability that there are no calls in the system.
   b. The channel utilization.

End of questions

With Best Wishes

Dr. Amira Ashour & Dr. Roayat Esmail